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FORT UNION COAL REGION

ANTELOPE TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

MERCER COUNTY, NORTH DAKOTA

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September 1981

Michael J. Penfold
State Director

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INTRODUCTION

The purpose of this action is to consider for leasing 12.5 million tons of strippable federal coal. The unleased federal coal in the tract represents five percent of the mineable coal. Coteau Properties Company obtained a lease for 16 million tons of federal coal in the tract in November of 1967. If not leased, this federal coal would be bypassed and probably never mined.

This site-specific environmental analysis has been prepared for the Antelope tract (Map 1) in accordance with federal regulations (43 CFR 3420). It will be used by the Fort Union Regional Coal Team to further consider competitive leasing of remaining federal coal within the tract for a June 30, 1983 coal lease sale schedule. If selected and scheduled, the Antelope tract will make available for leasing nearly 12.5 million tons of recoverable federal coal.

An Environmental Impact Statement was completed on all but the southeast part of the tract in 1977 for the ANG Coal Gasification plant and mine. The area was also included in the West-Central North Dakota Regional environmental impact statement (EIS) on Energy Development. Therefore the emphasis of this assessment is mainly on the remaining unleased federal coal.

BACKGROUND

In September of 1980, the Dickinson District Bureau of Land Management (BLM) Office adopted the West-Central North Dakota Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark, and Dunn counties, and a small part of Billings County. The land use planning process included identification of high or moderate potential coal areas, application of unsuitability criteria, identification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration for new competitive leasing, lease exchanges, and lease modifications.

Following land use planning, the BLM requested expressions of interest from industry. These expressions, along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

BLM Dickinson District staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. Among other things, certain of the unsuitability criteria were further considered. Any new findings would be reflected in this report.

Information from this and other site-specific analyses will be used by the Regional Coal Team during the tract ranking and selection process in preparation for a lease sale. The proposed tracts will be cumulatively analyzed in a regional EIS. Among the alternatives addressed in the EIS will be different combinations of tracts that meet a regional coal leasing target.

After reviewing the analytical documents, public comments, and the recommendations of the regional coal team, the Secretary of Interior will select specific tracts for the lease sale. The successful lessee will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

Tracts in the Fort Union Region are being considered in accordance with the federal coal management program adopted by the Secretary of the Interior in June, 1979. The basis of the program was, in part, the final environmental statement for the Federal Coal Management Program. Implementation procedures are contained in the Federal Regulations (43 CFR 3400). Authorizing actions are The Mineral Leasing Act of 1920, as amended; the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; and federal regulations concerning federal coal leasing and development, including 43 CFR 3400, 30 CFR 211, and 30 CFR 700-899.

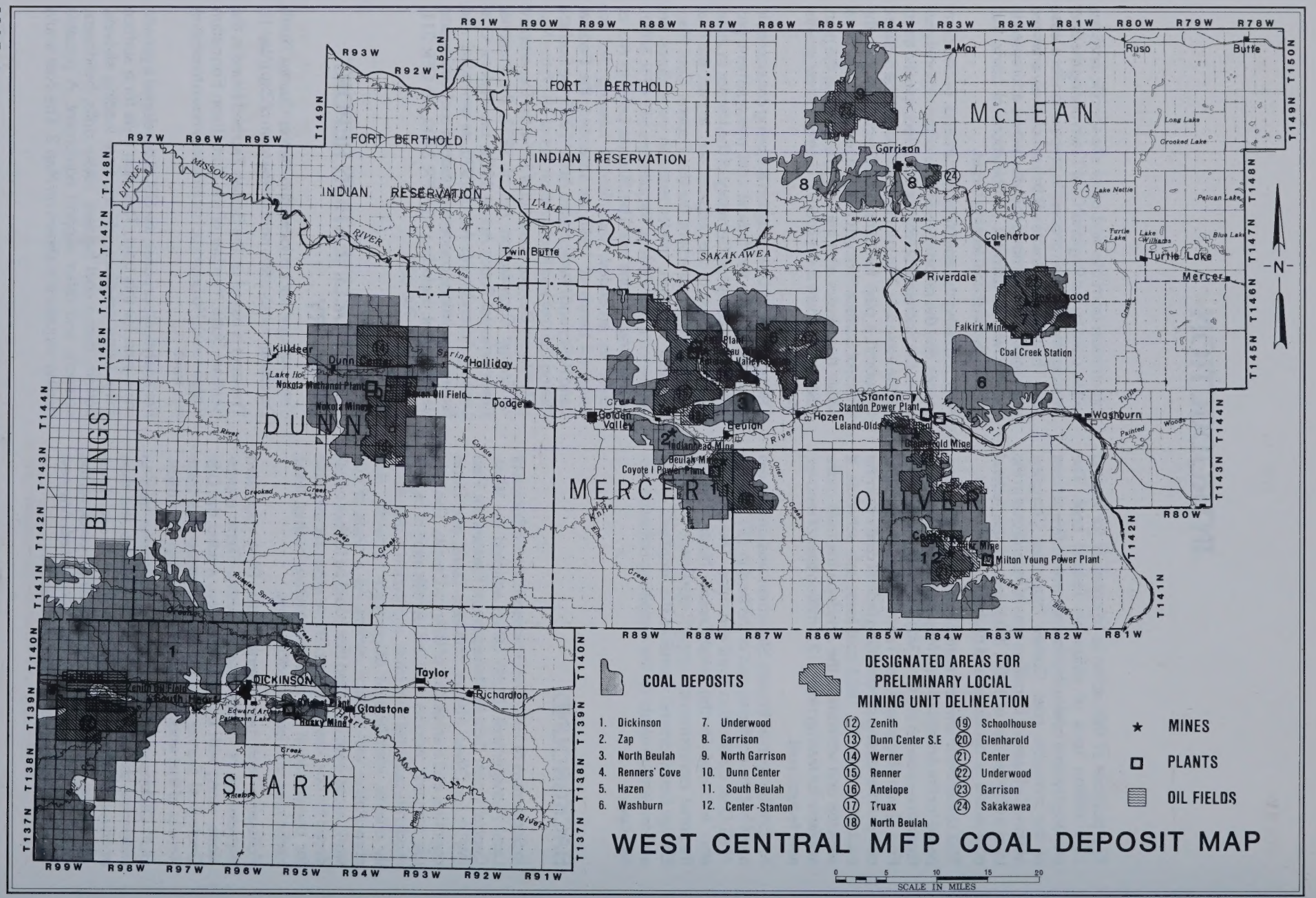
TRACT DELINEATION REPORT SUMMARY

The Antelope tract is located in Mercer County, North Dakota about six miles north of the town of Zap (Map 1).

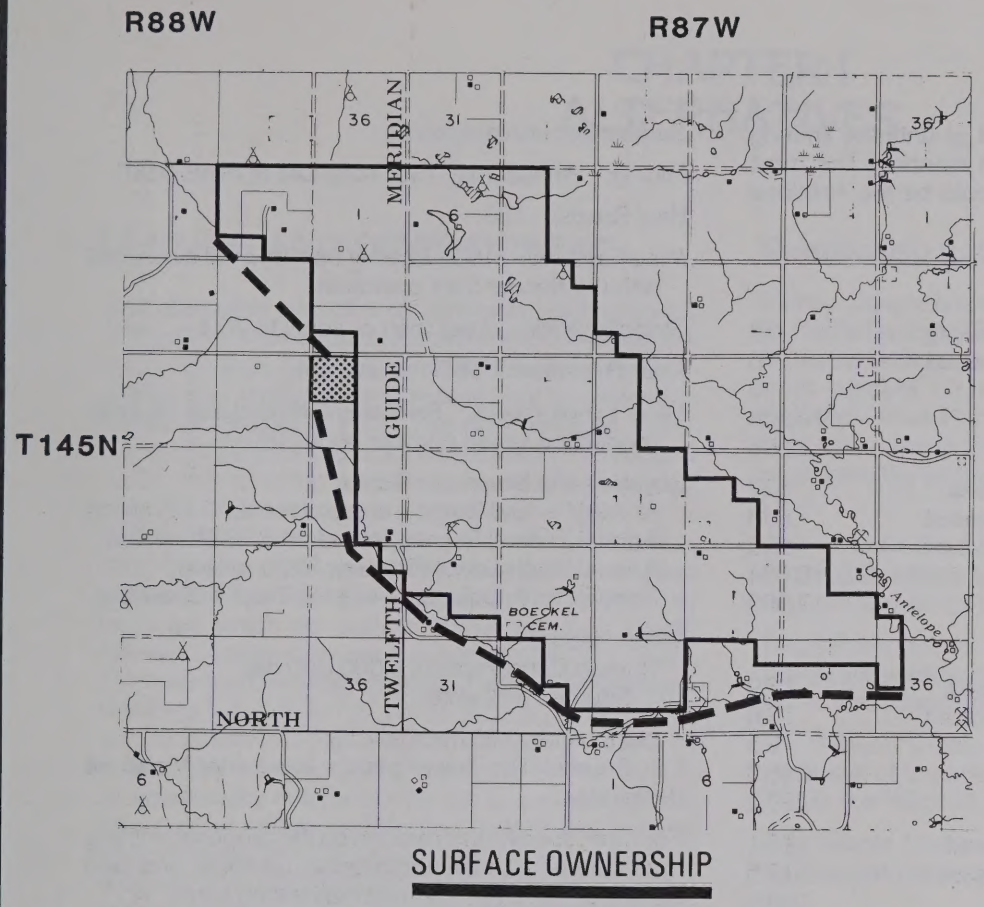
The tract is based on the Beulah-Zap bed found in the Sentinel Butte Member of the Fort Union Formation (Paleocene). No geologic hazards are known to exist on this tract.

For analytical purposes, the USGS developed a generic mine plan for this tract. This plan calls for a surface mine using draglines, electric coal loading shovels, bottom dump coal haulers, rotary drills, bulldozers, scrapers, and other support equipment. A possible mining sequence is shown on Map 2. The coal would

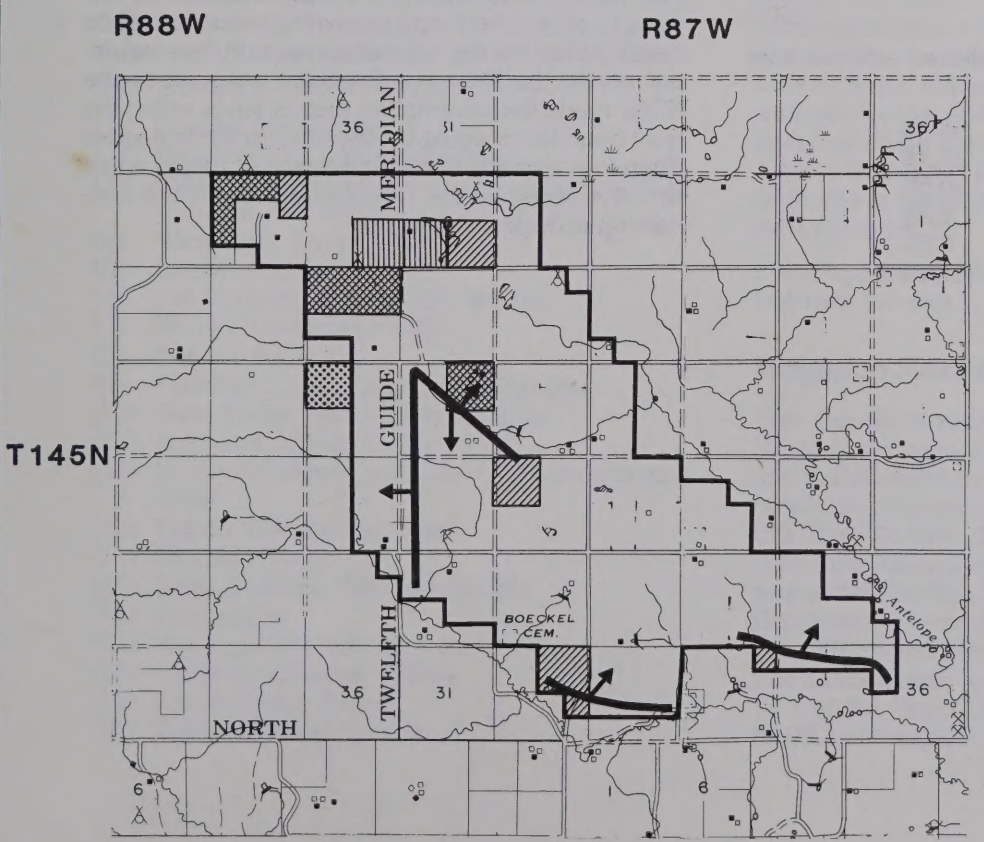
MAP 1



WEST CENTRAL MFP COAL DEPOSIT MAP

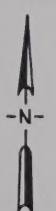


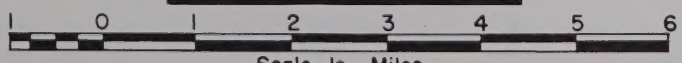
SURFACE OWNERSHIP



SUBSURFACE OWNERSHIP

ANTELOPE TRACT





MAP 2

be mined to a depth of 200 feet or until the limiting stripping ratio of 20:1 has been reached. The most probable end-use of the coal would be the Antelope Valley Power Plant.

Specific Tract Characteristics:

Acreage:

Surface:	Federal Leased	0
	Federal Unleased	0
	State	0
	Private	12,308
	Total:	12,308
Coal:	Federal Leased	677
	Federal Unleased	638
	State	320
	Private	10,674
	Total	12,309

Coal Reserves/Millions of Tons:

In Place:	Federal Leased	17.9
	Federal Unleased	13.8
	State	9.5
	Private	248.0
	Total	289.2
Recoverable:	Federal Leased	16.1
	Federal Unleased	12.5
	State	8.5
	Private	223.2
	Total:	260.3

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	36.1%
Volatile matter	27.3%
Fixed carbon	30.5%
Ash	6.2%
Sulfur	0.8%
BTU's/lb	6,919

Surface Disturbance/acres

Mining: Annual rate, 198; Total Life of Mine, 9,901

Haul Roads: 120

Mine Facilities: 160 - Already built and will be shared with the Renner tract operation.

Stripping Ratio: Less than or equal to 20:1

Coal Thickness: 16.7 feet average.

Mine Employment: Permanent employees at peak production would number about 180.

Royalties and Severance Taxes:
Annual Federal Royalty, unleased coal, $0.19 million
Annual Federal Royalty, leased coal, $0.56 million
Annual North Dakota Royalty, $0.20 million
Annual North Dakota Severance Tax, $4.68 million

Water Needs:
Human Consumption, 6,000 gal./day
Source: Well water

Nonpotable, 160,000 gal./day
Source: The power plant's water supply and pit dewatering.

For more specific information on the proposed mining operation refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the Resource Specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

This alternative is to offer for further consideration the 12.5 million tons of unleased recoverable federal coal in the Antelope tract for competitive leasing. Approximately 16.1 million tons of federal coal was leased to Coteau Properties in 1967. This tract has been identified as a logical mining unit for a 5.2 million ton per year surface mine having a 50 year mine life. The Antelope tract has been delineated within areas designated as acceptable for further consideration in the West-Central North Dakota Management Framework Plan adopted in September, 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to March 1, 1981. The tract has been fully cleared of unsuitability criteria numbers 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 16, 17, 18, 19, and 20 as defined in 43 CFR 3461. Criteria 9, 14, and 15 require further study. With the exception of criterion 3, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact statement; if not, this tract will be dropped from futher consideration. Criterion 3 will be deferred until mining and reclamation plans are submitted to the Office of Surface Mining and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

Mercer County is a center of coal energy development in North Dakota. The North American Coal Corporation's Indianhead mine, 8 miles south of the Antelope tract, supplies 1.2 million tons of coal annually to the Stanton Power Plant. North American's Falkirk mine, about 25 miles to the east, supplies 5.6 million tons of coal annually to the mine mouth Coal Creek Power Plant.

Knife River's Beulah mine, 15 miles southeast, produces 2.2 million tons of coal for the recently constructed Coyote 1 Power Plant.

Consolidation Coal Company's Glenharold mine, 24 miles southeast, supplies 3.8 million tons of coal annually to the Leland Olds Power Plant.

The Baukol Noonan Inc.'s Center mine, about 35 mile southeast of the area produces 4.1 million tons annually for the Milton R. Young Power Plant.

The Nokota Company proposes a mine and indirect liquefaction plant near Dunn Center, 3.5 miles to the west.

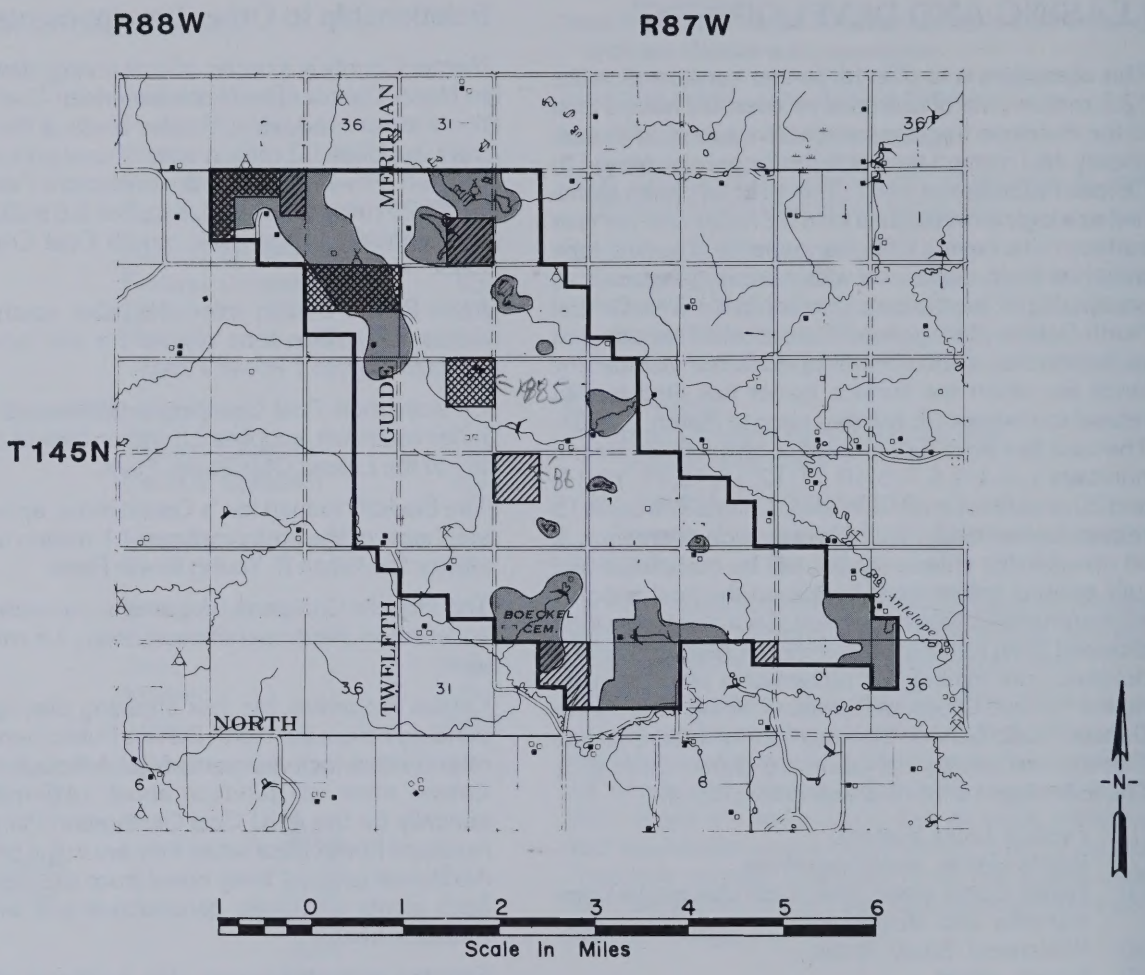
Coteau Properties, Inc. has a mining plan application pending before the North Dakota Public Service Commission that includes part of the Antelope tract. The Coteau mine will produce about 14.6 million tons annually for the ANG Coal Gasification Plant and the Antelope Power Plant when they are in full production. Additional coal will likely come from the Renner tract. Both plants are under construction just west of the Antelope tract.

Farming and ranching are also significant activities in and near the area

Mitigation Measures

This alternative assumes that proper mining and reclamation will be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement regulations (30 CFR 700-899), Environmental Protection Agency (EPA) regulations (40 CFR 0-1399), Council of Environmental Quality (CEQ) regulations (40 CFR 211), Department of Interior coal management regulations (43 CFR 23 and 3400), and North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).

ANTELOPE TRACT



LEGEND

Federal Coal

Federal Coal Lease

Areas being considered as unsuitable by BLM and others based on existing information.

Wildlife Habitat

Note: Detailed maps are available for inspection at the Dickinson BLM District Office.

(Rights-of-way too numerous to show.)

MAP 3

NO LEASING ALTERNATIVE

Federal coal would not be offered for lease under this alternative. The tract contains 12.5 million tons of recoverable unleased federal coal or about 5 percent of the total recoverable reserves. Individual federal parcels are scattered throughout the tract. A little over 16 million tons of federal coal has been leased. Assuming the pending mining plant application is approved, production could reach 5.2 million tons annually without the additional federal coal. The unleased 12.5 million tons of federal coal would be bypassed.

CHAPTER II
AFFECTED ENVIRONMENT

TOPOGRAPHY

The Antelope tract is located within the glaciated Missouri Plateau portion of Great Plains Physiographic Province. It is part of an isolated upland surrounded on the south, east, and west by glacial channels. The general area can be characterized as gently rolling upland with an average maximum relief of about 160 feet.

GEOLOGY AND MINERALS

The tract is underlain by about 500 feet of yellow-brown to gray, fine to medium-grained sandstone; interbedded gray and brown clay and siltstone; gray bentonitic clay beds; and lignite beds which collectively make up the Sentinel Butte Member of the Fort Union Formation (Paleocene).

The Beulah-Zap bed is the major lignite resource in the tract. This bed averages 16.7 feet thick. In place tonnage in the tract is approximately 289.2 million tons (17.9 million tons leased federal, 13.8 million tons unleased federal, and 248 million tons fee and state).

There is a slight potential for conflict with other minerals in the tract since the area has a small oil and gas potential.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

Most of the soils over unleased federal coal and any other surface holdings of those involved landowners within the Antelope tract have formed in a thin mantle of glacial till (Williams, Bowbells, Zahl) or from residual shale and sandstone (Cabba, Cohagen, Vebar). A few have formed in alluvium (Arnegard, Grail) and baked clays (Ringling).

The glacial till soils generally occupy rather gently sloping uplands except for the Zahl which is sometimes on hilly positions. The alluvial soils are found on fans, terraces, footslopes, and in swales. Except for Zahl, the soils in these two categories are deep, well drained, loamy and of medium to high natural fertility. The Zahl is more highly eroded and less fertile than the others.

The residual soils dominate the strongly to steeply sloping breaks from the uplands down into the drainageways. They are shallow, well drained, loamy and coarse loamy soils of low natural fertility. The water erosion hazard is high on these soils. Susceptibility to wind erosion is high on those with fine sandy loam textures (See Table 1).

The quality of soil involved in this analysis is reflected in the SCS soil suitability ratings and acreage figures (Tables 1 and 2). Of the 2,200 acres involved, 1,579 acres (72%) is in the "good" suitability category, 457 acres (21%) "fair," and 164 acres (7%) "poor." The Williams and Bowbells mapping units compose most of the acreage rated "good." The acreage rated "fair" is dominated by the Cabba, Cohagen, and Zahl mapping units. The Ringling, Rhoades, and Wabek units make up most of the "poor."

A tabulation of acreage in each of the three above mentioned categories by landowner over federal coal appears in Table 2. The data is presented in this manner because North Dakota law does not allow the transfer of soil material from one landowner to another unless written consent is given. Each surface owner's land must be reclaimed with soil originally removed from his holdings. The table therefore indicates the degree of difficulty to reclaim individual landowner holdings based on soil suitability as plant growth material on surface-mined land.

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY LANDOWNER IN THE ANTELOPE TRACT

LANDOWNER NUMBER	ACRES GOOD	FAIR	POOR	TOTAL
1	7	7	-	14
2	188	35	97	320
5	2	-	-	2
6	1	-	-	1
7a	127	33	-	160
b	160	-	-	160
8a	128	80	32	240
b	72	69	19	160
10a	7	33	-	40
b	234	121	5	360
11	4	14	5	23
12	649	65	6	720
TOTALS	1,579	457	164	2,200
% OF TOTAL	72%	21%	7%	100%

1/ Based on Table 1. Planimetry by Bureau of Land Management. Legal description of land and owner name corresponding to landowner number available at Dickinson District Office. Individual landowner holdings that are not contiguous are depicted separately by small letters.

TABLE 1
ANTELOPE TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
1 - Parnell silt loam	0-1	Low	Low	Good	-----
2 - Tonka silt loam	0-1	Low	Low	Good	-----
8 - Grail silty clay loam	1-3	Low	Low	Fair	Too clayey
8B - Grail silty clay loam	3-6	Low	Mod	Fair	Too clayey
17 - Heil silty clay loam	0-1	Low	Low	Poor	Too clayey; excess sodium
36 - Williams loam	1-3	Low	Low	Good	-----
36B - Williams loam	3-6	Low	Low	Good	-----
36C - Williams loam	6-9	Low	Mod	Good	-----
38C - Williams-Zahl loams	6-9	Low-Mod	Mod	Good	-----
38D - Zahl-Williams loams	9-15	Low-Mod	High	Fair	Too clayey; some lime
38E - Zahl loam	15-35	Low-Mod	High	Fair	Too clayey; some lime
44 - Arnegard loam	1-3	Low	Low	Good	-----
44B - Arnegard loam	3-6	Low	Mod	Good	-----
51 - Straw silt loam	0-1	Low	High	Good	-----
55C - Vebar fine sandy loam	6-9	High	High	Good	-----

TABLE 1
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Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
67 - Straw soils, channeled	0-1	Low	High	Good	-----
71B - Searing loam	1-6	Mod	Low	Good	-----
71C - Searing-Ringling loams	6-9	Mod	Mod	Fair	Ringling-excess rock fragments
73 - Belfield silt loam	1-3	Low	Mod	Fair	Clayey subsoil with sodium and salts
75B - Belfield-Daglum silt loams	3-6	Low-Mod	Mod	Fair	Clayey subsoil with sodium and salts
77 - Bowdle loam	1-3	Mod	Low	Good	-----
77B - Bowdle loam	3-6	Mod	Mod	Good	-----
81D - Cabba loam	9-15	Mod	High	Fair	Too alkaline; some lime
81E - Cabba loam	15-35	Mod	High	Fair	Too alkaline; some lime
83E - Cohagen-Vebar fine sandy loams	9-35	High	High	Fair	Cohagen-too alkaline
84E - Cohagen-Vebar-Rock outcrop complex	9-50	High	High	Fair	Cohagen-too alkaline, rock outcrop, no soil
86E - Wabek soils	3-25	Mod-High	High	Poor	Excess small stones; droughty, sandy subsoil

TABLE 1
ANTELOPE TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
87C - Rhoades-Daglum complex	1-9	Low	Mod	Poor	Too clayey, excess sodium and salts
92B - Noonan-Williams loams	1-6	Low	Mod	Fair	Noonan-excess sodium
94 - Makoti silt loam	0-1	Low	Low	Good	-----
98E - Ringling-Cabba complex	9-35	Mod	High	Poor	Ringling-excess rock fragments, Cabba-too alkaline, some lime
102 - Bowbells loam	1-3	Low	Low	Good	-----
109B - Bowbells-Zahl loams	3-6	Low-Mod	Low-Mod	Good	-----

1/ From "Soil Survey of Mercer County, North Dakota" SCS 1978.

2/ Derived by applying the properties of the soils which are described in the above mentioned soil survey report and "Official Soil Series Descriptions" to the guidelines developed by BLM-Montana State Office and adapted from information by Wm. Schafer, the Soil Conservation Service (SCS) and the Office of Surface Mining (OSM). These criteria are on file in Dickinson District Office of BLM.

HYDROLOGY

Surface runoff from this tract is to Antelope Creek and then the Knife River to the south and to Lake Sakakawea through intermittent streams on the north. Surface water use within the tract is for wildlife and stockwater purposes.

Shallow groundwater occurs in the mine disturbance zone in the Antelope Creek buried glacial valley aquifer and in sand and lignite beds of the Sentinel Butte Formation.

The Antelope Creek Aquifer is the major shallow groundwater resource in the area. It runs along the west and south sides of this tract and the coal subcrops along the edge of this valley system. Recharge to this aquifer occurs from Lake Sakakawea, downward seepage of ponded and stream water, and a small amount of water from lignite and sand zones that subcrop along the edge of the aquifer.

The Beulah-Zap lignite is the minable lignite of this tract. It is only partially saturated over most of the tract and has a limited water yield. Recharge to this system is from downward seepage of ponded and stream water.

Water quality of the groundwater reflects its source and aquifer material. Water in the Antelope Creek aquifer has better quality than that of the Beulah-Zap lignite.

Groundwater use in the tract is for domestic and stockwater supplies. Some wells in the tract draw water from the Beulah-Zap lignite.

VEGETATION AND AGRICULTURAL PRODUCTION

The Antelope tract is extensively used for agricultural purposes. Dryland farming methods, most notably alternate year summer fallow-cropping rotations, are widely practiced in the area. Sixteen percent of the operations which include land over federal coal (582 acres) is fallowed each year (Table 3).

Small grains including spring wheat, oats, corn, barley, winter wheat, durum, flax, and sunflowers (in descending order of acreage grown) are grown on 36 percent (1,331 acres) of the lands in operations which include lands over federal coal in the tract. Wheat yields average 25 bushels per acre. Much of the cropland production, especially the wheat portion, is sold as a cash crop. Oats, barley, and corn are also used as feed grains in livestock operations.

Six percent (223 acres) of the lands in operations which include lands over federal coal in the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.35 tons of hay are produced per acre.

Forty-two percent (1,585 acres) of the lands in these operations is rangeland and pastureland. Rangeland produces about .5 Animal Unit Months (AUMs) per acre. An AUM is the amount of forage needed to support a cow/calf for one month. Beef cattle are the predominant kind of livestock (North Dakota Crop and Livestock Reporting Service, 1980). There are also some dairy cattle, hogs, and sheep in the area.

TABLE 3
AGRICULTURAL LAND USE
ON THE ANTELOPE TRACT

Land Use:	Tract Acres	Average Production Per Acre 1	Total Annual Production
Cropland	1,331	25 bu.	33,275 bu.
Hayland	223	1.35 tons	301 tons
Range	1,585	.5 AUM	793 AUMs
Other	0	1.35 tons	0
Fallow	582	n/a	n/a
Total	3,721	n/a	n/a

1/ Crop : wheat equivalent bu./acre
Hayland: tons/acre
Range : AUMs/acre
Other : tons/acre of hay equivalent

There are approximately 20 acres of shelterbelts, field windbreaks, and farmsteads per operation. There are several woody draws in the tract which are populated by native trees and shrubs.

Except for reseeded rangeland, the rangeland is in the widespread Mixed Grass Prairie type (Shaver 1977). This includes species such as needle and thread, little bluestem, prairie sandreed, western wheatgrass, blue grama, side-oats grama, plainsmuhly, sedges, snowberry, fringed sagewort, and silver sage.

No threatened or endangered plant species as published on the 1980 federal list have been identified within the tract.

There are seven operators and operator partnerships which include land over unleased federal coal in the tract. Operations range in size from 40 acres to 880 acres inside the tract and from 480 acres to 5,374 acres in total.

Agriculture in the area includes crop operations, livestock operations, and mixtures of both. Most operations in the area include a balance between crops and livestock.

Two operations have less than 10 percent of their operations within the tract (Table 4). Two operations have 100 percent of their acreage within the tract while the other three operations range widely in the percent of their operation in the tract. Overall, the tract covers 27

TABLE 4

FARM/RANCH OPERATIONS - ANTELOPE TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
1	231	68	295	206	0	800	0	164	67	249	0	0	480	1280	62
2	0	0	40	0	0	40	100	599	242	1986	271	0	3098	3138	1
3	98	25	157	40	0	320	100	944	502	3424	184	0	5054	5374	6
4	82	16	584	39	0	720	56	160	38	402	40	0	640	1360	53
5	206	20	236	18	0	480	17	453	68	400	39	0	960	1440	33
6	251	25	40	164	0	480	100	0	0	0	0	0	0	480	100
7	463	69	233	115	0	880	18	0	0	0	0	0	0	880	100
TOTAL	1331	223	1585	582	0	3720	40	2320	917	6461	534	0	10,232	13,952	27

percent of the acreage of the operations involved.

Forty percent of the acreage within the tract is farmed under lease, by operators who do not own the land. Sixty percent is farmed by owner/operators.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The existing land use on the Antelope tract is primarily agricultural as previously described. Existing utilities and roads are generally along section lines and service farms and ranches of the immediate area. The roads exceeded their capacity to carry traffic. Of more than local significance is a blacktop road which provides access to the Beulah Bay recreation area. This road crosses the tract but has low traffic volume (average daily traffic is 245 vehicles).

Coal mining is not a new activity in the area but has played a role in shaping the area for three generations and continues to this day.

RECREATION

Hunting of a variety of native species (deer, upland game birds, waterfowl) is the only recreational opportunity offered to the public on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The communities of Zap and Beulah, North Dakota offer recreational opportunities in the vicinity of the tract. Existing ballfields, playgrounds, parks, and gymnasium facilities along with a swimming pool offer opportunities judged adequate by community leaders. Lake Sakakawea, north of the tract, offers state and federal recreational opportunities.

AESTHETICS

The character of the landscape, as noted in other sections of this document, is largely agricultural. The natural flat to rolling topography with average slopes of 0 to 15 percent have been superimposed with sharply defined crop areas. The appearance of the fields varies from year to year and season to season with actively cropped fields, fallow fields, plowed fields and native, grazed prairie. Roads running in a rigid north/south, east/west grid separate the fields. Vertical features in the form of buildings, shelterbelts, wind breaks, and wooded areas have an important visual function in breaking up the dominant horizontal aspect of the landscape and for providing orientation.

The area of concern is viewed primarily from Highway 37 and from county roads. The rolling profile of these roads provides two visual experiences: short range views of up to five miles from low points in the road and long vistas from the high points. The intermittent quality of the views implies the importance of vertical features for orientation.

Manmade features are a part of the character of the landscape. Most of the elements of these activities on the land are expected and appear fitting. While aesthetically pleasing and of high visual quality, the landscape is not highly valued as scenery because it is extensive and lacks variety.

Landscapes modified by coal mining are evident and are perceived locally as part of the land use pattern. Whereas the aesthetic surface of modified landscapes may not be considered pleasing, coal mining has a "fit" in the character of the land and is not, therefore, a cause for trauma either to local populations or to those passing through the area.

WILDLIFE

An unnamed tributary to Spring Creek borders this area to the south, and substantial wetlands and streamcourses flowing northwest into Renner's Bay of Garrison reservoir border the tract on the east. Two unnamed streams bisect the tract, and flow north into the reservoir. Native prairie and agriculturally disturbed land dominate this broken and rolling topography. Some excellent wetlands and wood shrublands are encompassed by the tract. The essential wildlife habitats account for the following percentages of the tract: woodlands 1.1 percent, wetlands 2.6 percent, native prairie 25.4 percent, agriculturally disturbed 70.3 percent.

The aquatic environment of the on-site wetlands and the off-site Spring Creek and Garrison reservoir, the native woodlands, and the interspersed native prairie in composite provide essential habitat for 31 sensitive species throughout the biological year.

Whooping crane, an endangered species, migrate through the area and use the regional wetlands (Table 5). The agriculturally disturbed land does not provide essential wildlife habitat, although it is used by numerous wildlife throughout the year.

Wetlands, specifically prairie potholes, are the most productive wildlife habitat in North Dakota.

Native grasslands represent relics of the original prairie ecosystem. They evolved during thousands of years and, once destroyed, cannot be exactly duplicated by

man. The rate of native prairie loss in North Dakota has been tremendous, and unplowed prairie is only 20 percent of the original total.

TABLE 5
WILDLIFE HABITAT AND SPECIES

Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

CULTURAL RESOURCES

Historic and prehistoric cultural resources have been recorded from the tract.

Fifty-five percent of the total surface of the tract has been the subject of intensive cultural resource inventory. Over federal coal, 79 percent of the surface has been the subject of the same inventory. This inventory has produced habitation sites as well as task-specific and exploitative sites (i.e., bison kill sites; lithic scatters of varying size, density and function; seasonal and long term habitation sites).

The rolling plains between the Knife and Missouri Rivers is an ideal location for the short term occupations that are seen in the cultural resources from the tract. Short trips to exploit a variety of resources from the area are evident in the pattern of prehistoric resources that have been recorded. It is likely that this pattern will continue to be recorded in the future. At present, none of the sites recorded on the tract would preclude coal mining and this will probably continue to be true after future surveys.

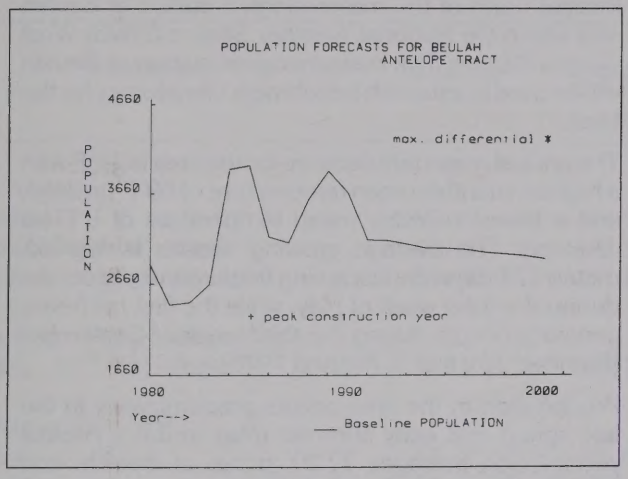
In the historic period, the dominant human activity in the area has been farming. While some stock raising has also taken place, most cultural manifestations are related to farming. This activity may also be responsible for the destruction of cultural resources.

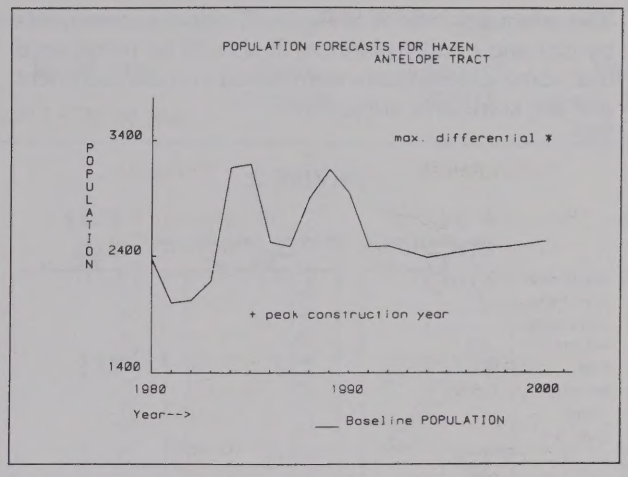
ECONOMIC AND SOCIAL CONDITIONS

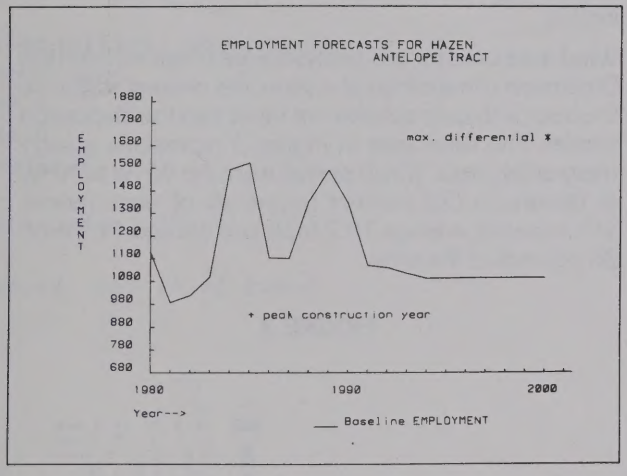
Existing and forecasted population and employment levels for the communities of Beulah, Hazen, and Bismarck/Mandan, North Dakota are shown in Figure 1. As can be seen from this figure, future population levels without federal coal leasing show considerable fluctuations through the early 1990's due to the construction of energy projects not directly related to the leasing of federal coal.

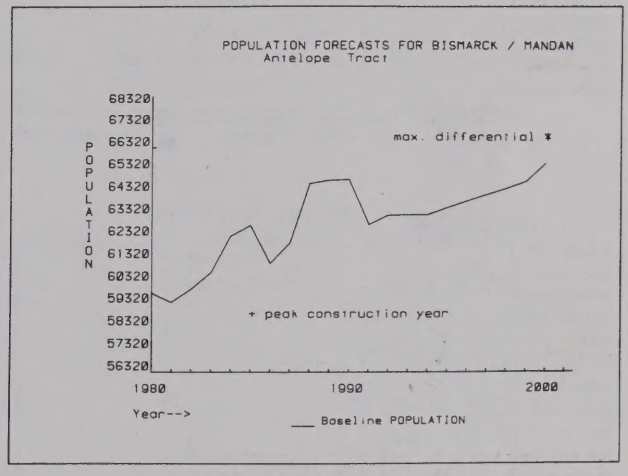
The vast majority of the employees at the Beulah-Hazen (Coteau) mine (with which the Antelope tract is associated) currently reside in Beulah, Hazen, Bismarck, and Mandan (Waldrun 1981). The present (1981) con-

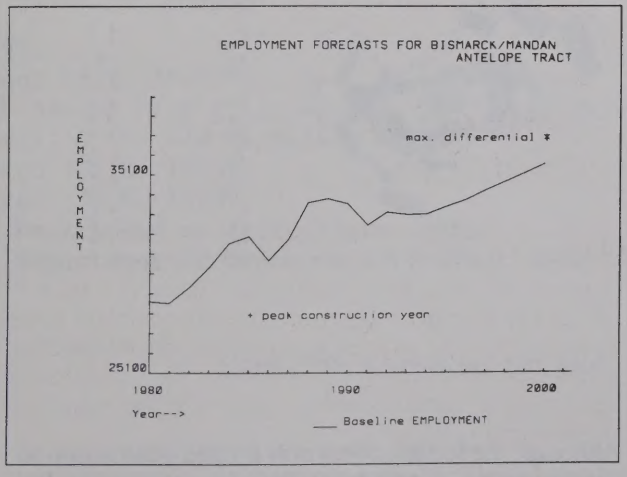
FIGURE 1

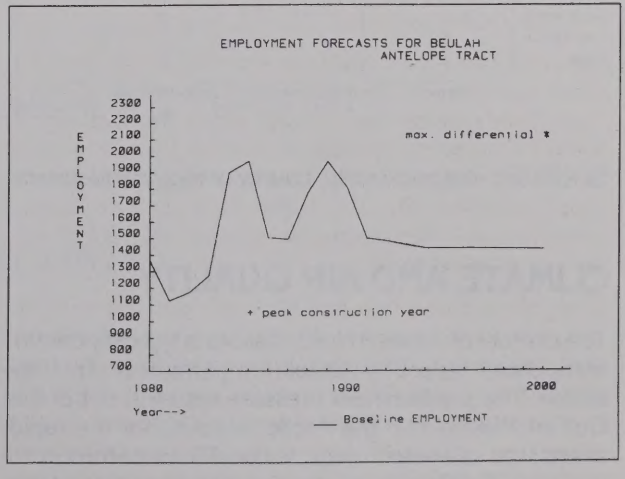










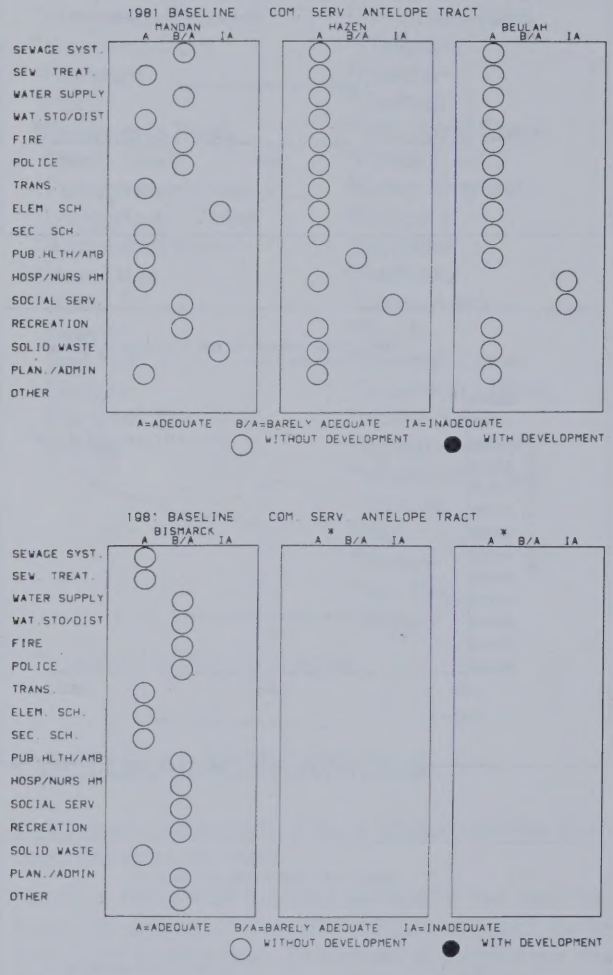


SOURCE: Mountain West Research, Inc., 1981.

dition of public services in the four communities is shown in Figure 2.

The adequacy ratings in Figure 2 reflect assessments by city and county planners. It should be recognized that some assessments were based on best judgment and are somewhat subjective.

FIGURE 2



SOURCE: Respective city/county or regional planners.

CLIMATE AND AIR QUALITY

The climate of western North Dakota is typically continental, characterized by variable temperature and precipitation. The predominant pressure systems, out of the Gulf of Mexico and the Arctic, account for the rapid alterations of meteorological conditions common to the area. Cold polar air masses dominate the winter months, while moist Gulf air masses prevail in the spring and summer, distributing the major precipitation across the area.

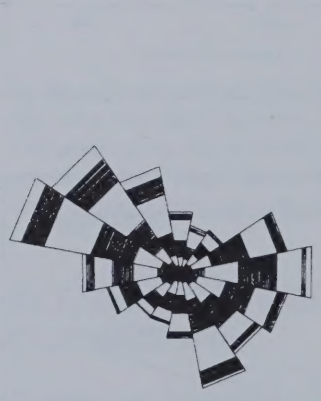
Meteorological data available from surrounding stations are shown in Tables 6 and 7. The Antelope tract is located north of the meteorological station at Beulah and within the National Weather Service (NWS) West Central Region. The meteorological station at Beulah will be used to establish benchmark climatology for the tract.

The annual mean temperature for the area is 41°F with a highest monthly mean temperature of 69°F (in July), and a lowest monthly mean temperature of 8°F (in January). The average growing season is approximately 121 days; the last spring freeze generally occurs during the third week of May, while the first fall freeze generally occurs during the third week of September (Ramirez, J.M. and T. Method 1976).

Precipitation in the area occurs predominately in the late spring and early summer (May to July). Annual precipitation averages 17.20 inches at Beulah, and 16.91 inches through the NWS West Central Region. The average annual snowfall at the Wibaux station is 27 inches.

Wind data used for this analysis were obtained from the Dickinson climatological station, the nearest station to the tract with data suitable for input into the dispersion model. The wind rose in Figure 3 represents a summary of this data. Winds prevail from the WNW to NNW at Dickinson (29 percent frequency of occurrence). Wind speeds average 10.2 mph and exceed 11.5 mph 36 percent of the time.

FIGURE 3



KEY

24.2 +
18.4 TO 24.2 mph
11.5 TO 18.4 mph
6.9 TO 11.5 mph
3.5 TO 6.9 mph
0 TO 3.5 mph

WIND DIRECTION	%
N	4.1
NNW	7.2
NW	10.2
WNW	11.4
W	6.5
WSW	4.9
SW	3.5
SSW	3.5
S	4.4
SSE	7.8
SE	6.5
ESE	7.2
E	8.8
ENE	7.2
NE	3.4
NNE	3.2

WIND ROSE FOR BISMARCK NORTH DAKOTA

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brum, Enz and Ramirez 1978).

TABLE 6
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Beulah	Center	Washburn	Dunn Center	Bismarck (WSO)	NWS West Central Region
Temperature, °F						
$\bar{X}$ annual, °F	40.6	40.5	41.9	40.2	41.4	40.6
$\bar{X}$ monthly low (Jan)	7.6	8.5	8.2	7.9	8.2	8.4
$\bar{X}$ monthly high (July)	69.3	69.0	70.8	68.7	70.8	69.4
Average growing season (temp. 32° F), days	121	117	133	122	133	120
Precipitation, in.						
Annual average	17.20	17.45	18.01	16.57	15.15	16.91
Monthly range	0.32-3.35	0.48-3.55	0.35-4.11	0.36-3.72		0.40-3.92
Annual snowfall	27	29.8	30	34	40	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					14.3	
Class D					56.4	
Class E, F					29.3	
Wind direction, (%)					W-NW(28)	
Wind speed, mph (% of time)					0-3.5 (4)	
					3.6-6.9 (13.4)	
					7-11.5 (30.5)	
					11.6-18.4 (39.1)	
					18.5-24 (11.3)	
					>24 (1.6)	
Average wind speed, mph					10.8	

*SOURCES:

Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Agriculture 1978.
U.S. Department of Commerce 1948-1974; 1973; 1974; 1979.

TABLE 7
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

*Recorded at Bismarck, North Dakota

Sources:
Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

Table 8 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 15 ug/m^3 (at Garrison) to 32 ug/m^3 (at Beulah). From 1974 to 1980 the annual geometric mean concentration of TSP at the Beulah residential monitoring stations ranged from 28 to 61 ug/m^3. For the purpose of the following computer analyses, the background rural TSP levels will be set at 24 ug/m^3 for the annual level and 100 ug/m^3 for the 24-hour level.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO_2 increment for the South Unit of the Park is consumed, or nearly consumed. Visibility was observed to range from 73 to 96 miles at the Theodore Roosevelt National Park during 1979 (John Muir Institute 1980).

TABLE 8
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m^3)	2nd Max. Observation (ug/m^3)	Annual Geom. Mean (ug/m^3)	Annual Arith. Mean (ug/m^3)
			State-Operated Sites:				
Beulah (rural)	74	TSP	10	488	47	26	69
	75	TSP	39	171	141	24	37
	76	TSP	51	81	61	24	29
	77	TSP	58	224	73	24	31
	78	TSP	52	288	258	32	52
	79	TSP	28	82	78	22	28
Beulah (residential)	74	TSP	32	1781	161	28	91
	75	TSP	48	151	126	34	41
	76	TSP	61	148	136	49	59
	77	TSP	58	290	149	45	55
	78	TSP	19	284	124	51	68
	79	TSP	45	214	197	51	67
	80	TSP	55	630	204	61	78
		SO_2	5517	104	73	<5	<5
Dunn Center (rural)	79	TSP	4	37	17	16	19
		SO_2	1896	78	26	13	13
	80	TSP	33	58	52	22	25
		SO_2	7332	52	39	<5	<5
Stanton (rural)	76	TSP	61	150	104	31	39
	77	TSP	60	237	90	24	32
	78	TSP	58	104	67	19	24
	79	TSP	42	90	80	19	25
			Privately-Operated Impact Source Monitoring Sites:				
Ramp #1 Beulah	79	TSP	11	161	93	57	69
		SO_2	1403	78	65	<5	<5
	80	TSP	59	642	125	24	41
		SO_2	6250	81	63	<5	<5
Ramp #2 Beulah	79	TSP	11	76	74	42	47
		SO_2	1401	73	52	<5	<5
	80	TSP	57	613	156	25	45
		SO_2	6251	91	84	<5	<5
Ramp #3 Beulah	79	TSP	11	1000	114	85	158
		SO_2	1403	47	39	<5	<5
	80	TSP	58	141	96	26	34
		SO_2	6239	148	107	<5	<5
Ramp #4	79	TSP	11	121	120	70	81
		SO_2	1403	102	63	<5	<5
	80	TSP	41	523	161	24	45
		SO_2	4141	165	151	<5	<5
Ramp #5	79	TSP	11	129	89	45	56
		SO_2	1404	37	31	<5	<5
	80	TSP	59	707	126	21	41
		SO_2	6164	60	57	<5	<5
Coteau #1	80	TSP	45	572	134	26	46
Coteau #2	80	TSP	41	700	308	49	80
Coteau #3	80	TSP	29	815	206	41	80

*SOURCE - NORTH DAKOTA STATE DEPARTMENT OF HEALTH

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CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour of the land over unleased federal coal would be modified during surface mining (9,901 acres in the tract). Although most would be returned to its approximate original contour, difference in detail would remain, including drainage patterns and final sloped highwalls.

In general, the reshaped ground would not be steep enough to cause slope failures and related hazards. Until natural vegetation can be reestablished, accelerated sediment yield and unsightly scars on the land would be potential problems.

GEOLOGY AND MINERALS

Mineral resource conflicts might occur between development of oil and gas and mining coal since there is at least a slight potential for finding oil and gas on the tract.

No geologic hazards are known to exist on the tract.

SOILS AND RECLAMATION POTENTIAL

Impacts on the soil resource on lands above federal coal in this area have previously been discussed in Bureau of Land Management planning documents and the Draft West Central North Dakota Regional Environmental Impact Study and the ANG Coal Gasification Company EIS. Briefly, the basic impacts are the disruption of the present soil bodies with temporary loss of productivity,and problems with erosion, compaction, soil removal and replacement, and instability.

Soil erosion and compaction would not be new to the area because of the presence of dryland agricultural activity. Over one-half of the acreage involved in this analysis is being farmed. Sixteen percent of the total land, or thirty percent of areas presently under dryland farming is annually left bare of protective cover due to summer-fallowing. Existing erosion impacts from these conditions will continue with or without the presence of an active mine.

Stripping of suitable soil material on the steeper slopes may be difficult. Extra care would be required to operate removal equipment so as to maximize the amount of suitable soil that is saved. Control of surface runoff would be very important during this time to avoid soil loss and sedimentation problems in the drainageways.

Even though the areas with steep slopes would probably be left more gently sloping with reclamation, there would still be enough variation in relief to make the required protective measures such as mulching and seeding of rapidly germinating and quick growing cover crops extremely important. Otherwise, the newly replaced soil would be highly susceptible to erosion.

Some instability problems would probably appear with the onset of reclamation. Area wide settling, localized subsidence or collapse, and underground erosion called piping may occur (Groenwald, 1980). However, if the stipulations governing the handling of soils and overburden during surface mining operations are closely adhered to and enforced, instability impacts should be kept minimal.

The soils will be lost to the production of grass, forage, and grain over the short term use. About 10 years would be required for restoration of agricultural production on each annual disturbance (198 acres) of the tract for coal mining. This loss would occur only on the active portion of the mine at any given time. Once in full operation, the total tract area out of production in the mine as a whole in any peak mining year is estimated at about 2,000 acres. Soils would be continuously replaced on mined-out areas and brought back into production during the life of the mine (50 years).

Preliminary indications from completed and ongoing research by such agencies as the Science and Education Administration—Agricultural Research of Mandan, North Dakota and North Dakota State University—Agricultural Experiment Station of Fargo are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementation of a concerted reclamation effort (Power 1974).

With a successful reclamation effort, return of agricultural productivity of the land involved in this analysis should be possible. Soils Table 2 in Chapter II indicates that landowners have sufficient acreage of soil rated "good" and "fair" for supplying cover soil material in surface mine reclamation. By averaging suitable plant growth material from the better soils and/or overburden and leaving steeper slopes more gently sloping with reclamation, it might even be possible to improve the overall productivity of the land, especially that portion rated "poor."

HYDROLOGY

The unleased federal coal in this tract covers a small area and is widely scattered. In most cases these federal coal areas are surrounded on all sides by private coal that will be mined. Under these circumstances most of the impacts discussed below will occur to federal coal areas whether or not it is mined.

As the Beulah-Zap lignite is mined, an aquifer material will be removed. While the mine pits are open, water levels in the lignite aquifer would be drawn down in the area surrounding an open pit. The distance from an open pit that this drawdown will occur is variable and dependent upon the local aquifer characteristics.

The physical disturbance caused by mining would also result in changes in the chemical quality of the local groundwater. Increases in sodium, sulfates and total dissolved solids concentrations have been reported by Groenewold (1979 and 1980) at other mines in North Dakota with similar overburden. The changes in water quality were variable and dependent upon overburden characteristics and reclamation practices. The quality of water in the replaced overburden will be similarly degraded.

This impact would be limited to the area within the tract. There are only two or three additional wells that could experience this impact if federal coal is mined. Replacement water supplies are available from Lake Sakakawea and deeper aquifer zones.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 198 acres of the total tract area per year from its current uses, the major one of which is agricultural production. The first land taken out of agricultural operations, except for the plant site and ancillary facilities, will occur in the first year of mining. The time period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 50 year period.

Mining would be the land use of any one location for one to five years. Reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Service Commission agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would occur during the first appropriate season after grading to topography and replacement of topsoil.

The company would be under bond for at least ten years, or as long as necessary to prove, at a 90 percent confidence level, that agricultural productive capacity had been restored (Public Service Commission, Reclamation Department, 1980). Reclamation research by such agencies as the Science Education Administration—Agricultural Research Service of Mandan, and North Dakota State University—Agricultural Experiment Station of Fargo indicates that some degree of optimism for the restoration of land to agricultural production is justified, although there is no certainty as to how long it would be be before all mined land would be judged as fully restored as the law requires.

The development alternative would have a significant short-term impact on individual agricultural operations which include land over the federal coal in the tract. By the end of the 50-year mine life, 12,302 acres of the tract would be disturbed, in addition to 160 surface acres used for mine facilities.

For the lands over federal coal, 3,721 acres, an average of 71 acres of cropland, excluding 582 total acres of summer fallow, would be removed from production on these operations each year, assuming an annual disturbance of 198 acres over a nineteen year period. This would be an average annual loss of 1,775 bushels of wheat. This 71 acres of cropland would be out of production ten years with a maximum of 705 acres out of production in any one peak mining year, resulting in a maximum loss of 17,625 bushels of wheat annually.

Peak mining year disturbance of 118 acres of hayland on operations with land over federal coal would result in an annual loss of 159 tons of hay production.

An average of 83 acres of rangeland on operations which include land over federal coal would also be removed from production each year, resulting in an average loss of 42 AUMs. This 83 acres of rangeland would be out of production ten years with a maximum of 940 acres out of production in any one peak mining year, resulting in a maximum annual loss of 420 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated the Bureau of Land Management doing agricultural data collection on the preliminary logical mining unit instead of the later final logical mining unit. The data may not completely represent the logical mining unit in its final form.

It is likely that some introduced species will be used. The laws require that introduced species be of the same seasonal variety and equal or superior in utility to the native species. Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have reestablishment problems on some of the less suitable soils.

Forbs, woody plants, and trees (woodlands) must be reestablished along with grasses.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Existing land use in the tract area would be displaced but would be restored in compliance with North Dakota and Federal law. As leasing implies only extension of currently existing use, the intensity of use is not expected to change but to extend existing conditions through a longer period of time.

RECREATION

Habitat destruction and the resulting loss of wildlife species (deer, upland game birds, waterfowl) will damage recreational hunting. The impact of this loss has been assessed in the wildlife portions of this document. From the recreation perspective, it is likely the loss will be manageable.

Social and economic studies have documented demographic changes resulting from mining that will stress Garrison, North Dakota, and other communities in the vicinity of the tract. This stress will be felt on the available recreation facilities in the communities. Outside of the communities, increased pressure will be seen on private and public land because of recreational opportunities lost to mine related impacts.

AESTHETICS

Coal mining is a visible part of the landscape as it now exists and views of this type of activity should be within the expectations of those traveling through the area. The impact of unnatural land forms and large scale operations should thus surprise no one, diminishing the effect of additional coal mining in the region. Whereas mining does not display a particularly attractive aesthetic surface, the characteristics of mining form part of the character of the landscape, minimizing its perceived adverse value. The reduction of visual amenity depends primarily upon the quality of the design of the mine itself in relation to the location from which it is seen. These views of the coal operation would be of short duration under the worst of conditions, and under the best conditions of reclamation the impact to the visual surface would be insignificant and the loss of amenity would be restricted to short periods of time and to the area of active mining.

The most visible features would be spoil piles, topsoil stock piles, heavy equipment, buildings and other structures and the smoke and dust associated with active mining. Of these, smoke and dust are the most undesirable from a visual standpoint. Because coal mining is a part of the character of the region, other features of mining need not seriously impair the visual surface of the area from normal observer positions.

WILDLIFE

On-site effects to wildlife resources would be degradation and loss of the three essential habitats: woodlands, wetlands, and interspersed native prairie. If these habitats are destroyed by mining within the proposed tract, it will constitute a significant local negative impact and an irretrievable commitment of wildlife resources.

Off-site aquatic habitats of the Garrison reservoir and Spring Creek would be recipients of potential point and non-point contaminants.

There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands, and native prairie and they are not replaced in full (compensation) or are converted to farmland.

Mobile wildlife such as birds and large mammals may shift about the habitat losses to some degree, but non-mobile species such as reptiles and amphibians would be destroyed. The very limited availability and disruption of riparin woodlands and wetlands would restrict, and in many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust, and affiliated disturbances cumulatively may cause wildlife to vacate unmined habitats and may preclude adoption by wildlife of those rehabilitated areas until the disturbances are eliminated. This may be for the life of the mine and rehabilitation period, which may be as long as 20 or more years.

Increased human population resultant of mine development and operations generally reduce wildlife populations and habitat locally and off-site by poaching, road kills, increased legal harvest, disturbance of reproductive and migratory periods and habitats, harassment by recreationists, feral and uncontrolled cats and dogs, and degradation and complete loss of habitat due to housing, shopping, waste treatment, services, and similar urban development. The problem is compounded in areas where shift changes of workers coincide with wildlife feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts, available to entities other than BLM, would be to provide mass transportation of workers and adjust the times of shift changes, which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement or adoption of a poaching clause in union contracts would also help.

Successful reclamation of native woodlands and natural wetlands such as "potholes" and riverine wetlands has not been demonstrated. Native prairie has not been successfully reclaimed either, although some prairie plowed about 70 years ago and since left undisturbed shows some evidence of native plant species reestablishment.

Concurrent reclamation of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the less negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands is expected to become a permanent loss.

At present there is no information to suggest that natural, biologically viable wetlands (e.g., potholes) can be reclaimed from mine spoil in this country. It would be most productive and conservative to eliminate mining from the larger wetlands, thereby retaining the critical soils structure of the wetlands and eliminating the extended delay proposed for wetlands reclamation attempts. Destruction of natural viable wetlands by strip mining under the present state of biological and hydrological knowledge would be an irretrievable commitment of wildlife resources.

An interagency team of Wildlife Biologists from the North Dakota Game and Fish Department, U.S. Fish and Wildlife Service, and Bureau of Land Management have identified and recommended areas for the application of unsuitability criteria (Map 3, Chapter I). Formal recommendations have been received by BLM from the three groups. Joint agreement among the agencies and final decisions on unsuitability, exemptions such as producing leases, and exceptions will be completed in August.

CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

Sites not directly impacted by earth disturbance may be impacted as a result of the earth disturbance. These secondary impacts can include vandalism increased by improved access, loss as a result of erosion, or degradation resulting from disruption of natural setting.

In the event of lease, stipulations covering cultural resources will have to be developed. These stipulations will have to treat both recorded and unrecorded sites. They will also have to require management plans for cultural resources that detail mitigation plans for each site to be impacted. As in any cultural resources mitigation, preservation alternatives are preferred. If these are not viable options, then scientific data recovery programs will have to be developed.

ECONOMIC AND SOCIAL CONDITIONS

It is unlikely that the employment level of the mine would significantly change if the Antelope tract was leased. Without a change in mine employment, the population level of the surrounding communities would remain stable. This would result in no additional impacts to community services.

The only effect of leasing on community services would be a continuation of the existing level of demand for these services for an additional 40 years (life of the mine). The present condition of public services in communities where existing mine employees reside was shown in Figure 2.

Technical reports are available which discuss the methodology used in the economic and social analysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 38 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 6,919 Btus. The ratio of energy produced to that expended is 184 Btus/1 Btu.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action cannot be addressed specifically. This is due to a lack of technical information and research work on the topic of potential impacts on climate. However, general climatic influences applicable to the proposed development can be discussed.

The modification of surface contours and albedo due to redistribution of soils and removal of vegetation may produce slight localized changes in wind speed and direction, temperature, and humidity. Impacts associated with the increased particulate emissions could also alter local climatic conditions. Reclamation with reestablishment of vegetation and a stable landscape should largely mitigate these impacts over the long-term.

The methodology for determining the air quality impact of particulate emissions consists of: 1) obtaining mine profiles for the tract from BLM; 2) obtaining emission factors for individual surface coal mining operations; 3) using the mine profile and emission factors for calculation of total emissions; 4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations; and 5) comparing predicted concentrations to Federal

and State Ambient Air Quality Standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the proposed tract's peak production period.

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 9.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine is not a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment. Table 10 shows Federal and State PSD standards.

During peak production of the mine an estimated 2,341 tons per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 97 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National Ambient Air Quality Standards. Areas within the active mining area such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

The isopleth lines on Figure 4 indicate annual average particulate concentrations that could result during peak production. The highest concentration at a location off the mine site could be 8.2 ug/m^3. This level does not exceed the allowable Class II PSD annual increment for particulates. With the estimated annual background concentration added (24 ug/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 5 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 67 ug/m^3. This level would consume the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (100 ug/m^3), the ambient level would be 167 ug/m^3. This level exceeds the State Ambient Air Quality Standard and the Federal Secondary Ambient Air Quality Standard. A violation would occur if the ambient air standard was exceeded more than once per year. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this is subject to the mine emissions and the corresponding background levels in the area.

Because the proposed action totally consumes the allowable Class II PSD increments for particulates, any associated PSD source could not contribute significantly (5 ug/m^3-24-hour) to the PSD's Class II annual or 24-hour particulates increment.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.

TABLE 9
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m^3	75 ug/m^3	60 ug/m^3	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m^3	260 ug/m^3	250 ug/m^3	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standard)			15 tons/ sq. mile	Max. 3-month arithmetic mean in residential areas
				30 tons/ sq. mile	Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m^3)	60 ug/m^3 (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		.14 ppm (365 ug/m^3)	260 ug/m^3 (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m^3)		715 ug/m^3 (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO_3/100 cm^2/day	Max. annual arithmetic mean
				0.50 mg SO_3/100 cm^2/day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m^3 12 ug/m^3	Max. annual arithmetic Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic mean
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
				30 ug/m^3	Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 9 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m^3 (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m^3 (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	10 ug/m^3 (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m^3)	35 ppm (40 ug/m^3)	40 ug/m^3 (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	235 ug/m^3 (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm (160 ug/m^3)	.24 ppm (160 ug/m^3)	160 ug/m^3 (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm (100 ug/m^3)	.05 ppm (100 ug/m^3)	100 ug/m^3 (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m^3 (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m^3	1.5 ug/m^3	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

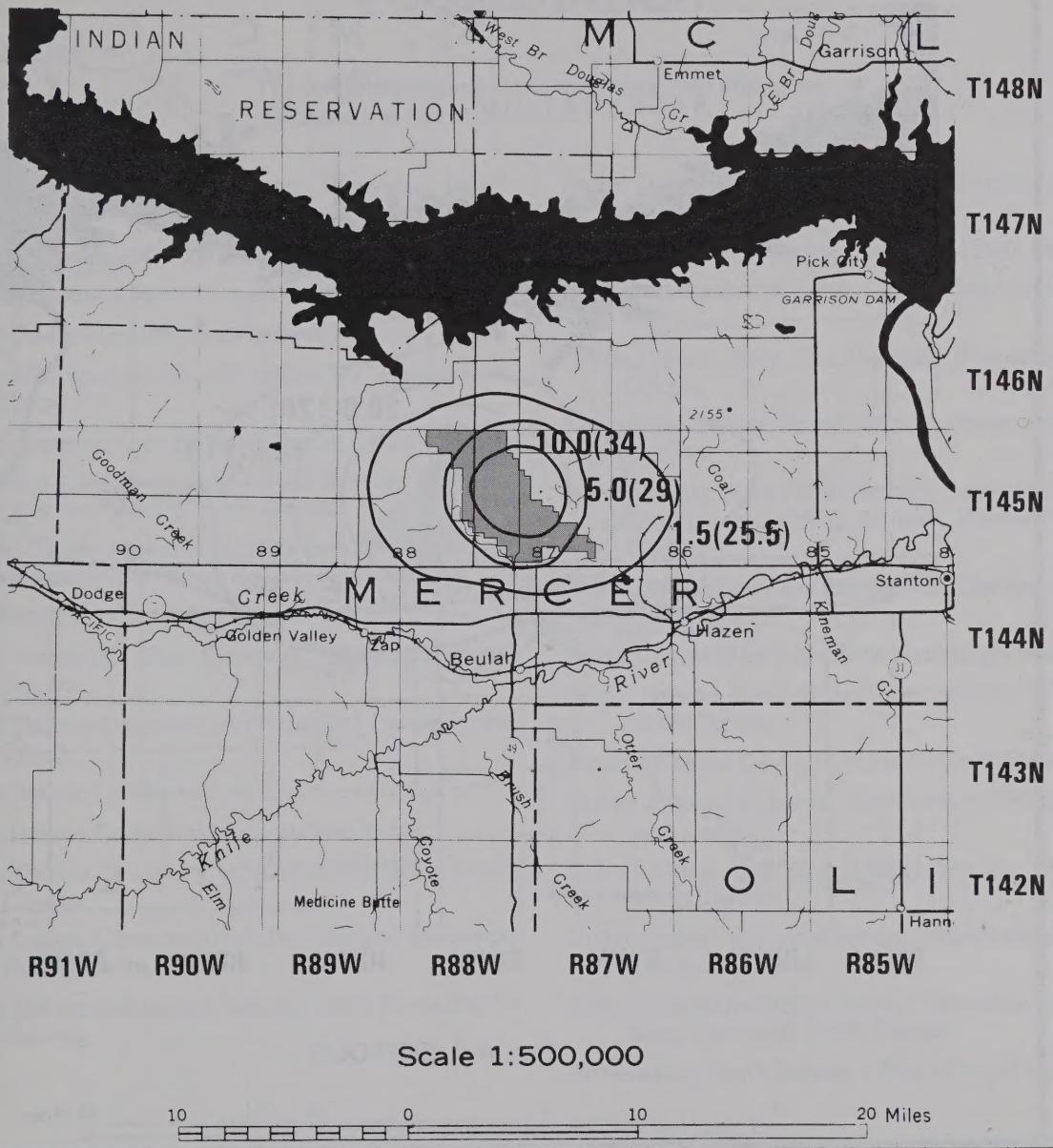
TABLE 10
FEDERAL AND STATE PSD STANDARDS

	Federal	State
Major Sources, subject to PSD review	100[1]	100[3]
(excludes fugitive dust emissions) (t/yr)	250[2]	250[4]
Major Sources, not subject to PSD review-counts against PSD increment	100[1]	100[3]
(considers fugitive dust emissions) (t/yr)	250[2]	250[4]
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean (ug/m^3)	5	5
24-hour maximum (ug/m^3)	10	10
Class II		
annual geometric mean (ug/m^3)	19	10
24-hour maximum (ug/m^3)	37	30
Class III		
annual geometric mean (ug/m^3)	37	37
24-hour maximum (ug/m^3)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean (ug/m^3)	2	2
24-hour maximum (ug/m^3)	5	5
3-hour maximum (ug/m^3)	25	25
Class II		
annual arithmetic mean (ug/m^3)	20	15
24-hour maximum (ug/m^3)	91	91
3-hour maximum (ug/m^3)	512	512
Class III		
annual arithmetic mean (ug/m^3)	40	40
24-hour maximum (ug/m^3)	182	182
3-hour maximum (ug/m^3)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC
Requirement for Preparation, Adaption and Submittal of Implementation Plan.
1978. Title 40 CFR, Part 51.



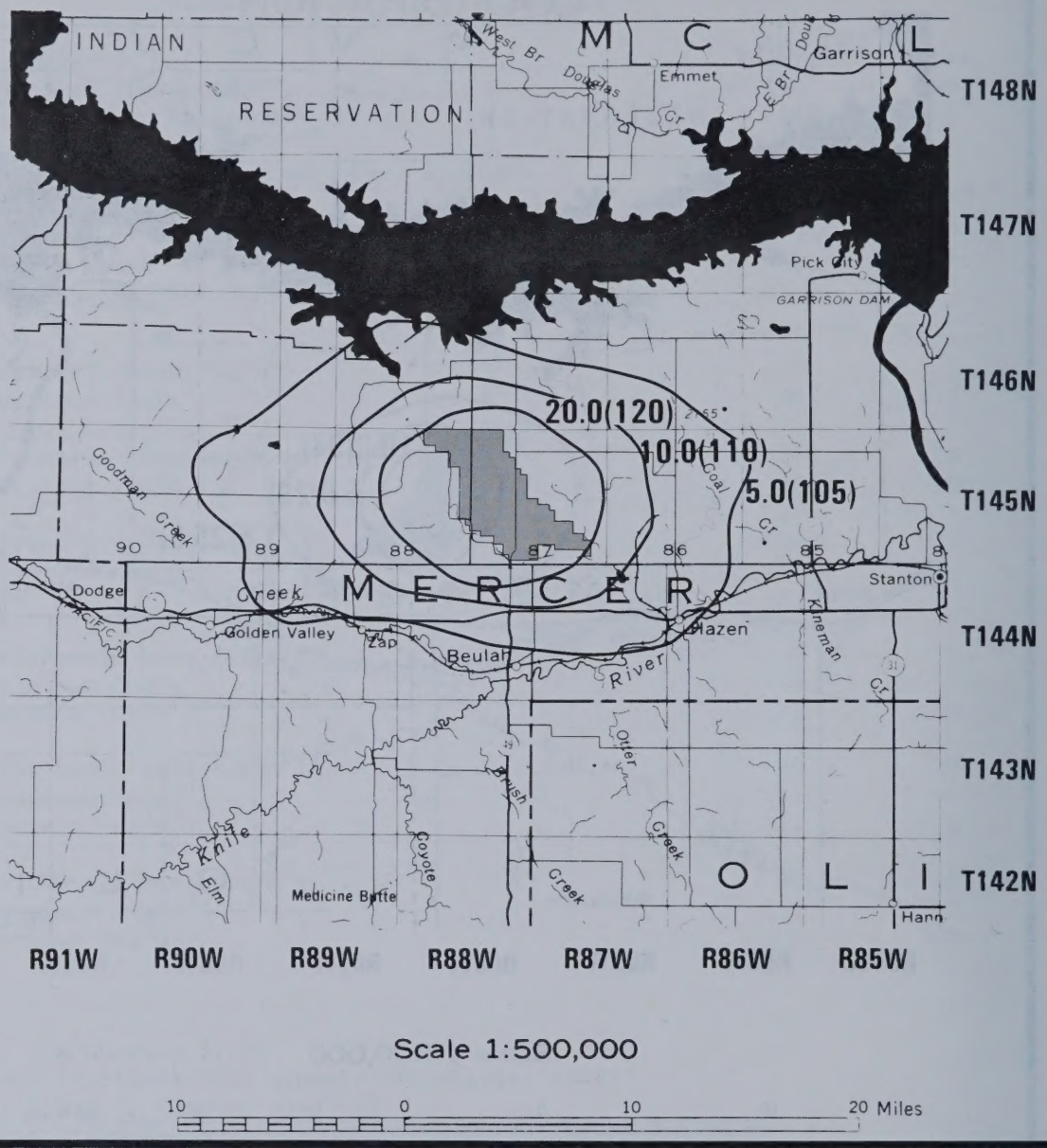
Antelope Tract

TSP Annual Average Concentration (ug/m^3) Isopleths

-N-

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 4



Antelope Tract

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

-N-

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 5

CHAPTER IV
CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Bismarck Planning Director; Bismarck, North Dakota.

Center Mayor and Town Council; Center, North Dakota.

Cumin Associates; Billings, Montana.

Eastern Montana Social and Community Services Task Force.

Energy Development Board of Mercer County.

Lewis and Clark Regional Council Mandan Planning Director; Mandan, North Dakota.

Mercer County Agricultural, Stabilization and Conservation Service Office; Beulah, North Dakota.

Mountain West Research; Billings, Montana.

North American Coal Company; Bismarck, North Dakota.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshall; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

United States Bureau of Reclamation; Billings, Montana.

United States Fish and Wildlife Service, Bismarck, North Dakota.

United States Geological Survey, Conservation Divsion; Billings, Montana.

United States Geological Survey, Water Resources Division; Bismarck, North Daktoa.

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SUMMARY MATRIX
ANTELOPE TRACT
RESOURCE AND ENVIRONMENTAL CONSIDERATIONS

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Gently rolling uplands.	Less contrasting topography with slight modification to drainage patterns.	Low	Good	
Geology and Minerals					
Geologic Hazards	None identified	None	N/A	Good	
Potential for Other Minerals	Low (Oil and Gas) - This tract is located in the Williston Basin.	Low - There has been exploration activity in the area.	Mining could interfere with development of oil and gas.	Good	
Paleontological Resources	Low - None identified to date.	Will improve knowledge of the resources near the mine.	Low	Good	
Soil and Reclamation Potential					
Soil Erosion Potential	Wind - Low to mod over most of the land above Federal coal. Water - Mod to high over most of the land above Federal coal.	Increase with soil handling operations but little overall change because of presence of dryland agricultural activity.	Minimal	Outstanding	
Toxic Elements in Soil	No problems	None	None	There has not been a need for this data.	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Chemicals Corrosive to Metal or Concrete in Soil	Corrosivity of most soils to: Untreated steel - High; Concrete - Low.	None	None	Outstanding	
Highly Saline/ Sodic Conditions	There are a few small, scattered areas of saline/sodic soils.	These areas can possibly be improved by replacing with better plant growth material from surrounding soils and/or the overburden.	Minimal	Outstanding	
Character of Subsurface	This area is adjacent to the east side of the Renner tract so the overburden situation is likely to be as described on that Matrix. Often the top 10 to 20 feet and sometimes as much as 50 to 80 feet of the overburden is suitable for use in reconstructing soil profiles. The remainder has high salinity, sodicity, pH, and clay contents.	Some instability problems (settling, piping) may appear with the onset of reclamation. Some of the overburden could be used to improve areas with soils rated "poor" for final cover of surface-mined land.	Minimal	Outstanding	
Reclamation Potential					
Based on soil suitability for final cover of surface mined land, the chance for successful reclamation of the land involved in this analysis appears to be high.				Outstanding	
The breakdown of soil suitability totals from Table 2 are as follows: "Good" - 1,579 acres, 72%; "Fair" - 457 acres, 21%; and "Poor" - 164 acres, 7%.					
Precipitation could be a limiting factor for reestablishing vegetative cover some years.					

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Hydrology					
Degradation of of Groundwater Quality	Shallow groundwater generally does not meet Public Health Service drinking water quality standards but is acceptable for domestic and stock water purposes.	Groundwater quality will be degraded in the tract.	Between 4 and 8 wells used for domestic and stock watering are located over Federal coal and will be affected.	Hydrology - Outstanding Well Inventory - Acceptable	These wells will probably experience impacts from mining the private coal even if the Federal coal is not leased.
Vegetation					
Cropland	There are 1331 acres of land in the tract that are currently being cropped.	Average annual loss of 71 acres excluding 582 total acres of summer fallow. Annual production on this 71 acres would be 1775 bu. of wheat. Maximum loss in any one peak mining year would be 705 acres and 17,625 bu. of wheat.	Moderate to high, depending upon individual operation. Low to moderate for overall tract production.	Good	
Rangeland	Average annual production is 793 AUMs.	Average annual loss of 42 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 840 acres and 420 AUMs.	Moderate to high, depending upon individual operation. Low to moderate for overall tract.	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Agriculture	There are 7 operators in the tract.	The same number of operators will be affected, to varying degrees, by a long term but temporary loss of acreage for agricultural production.	Very significant to the operators involved.	Outstanding	
	27% of the involved operators' acreage is in the tract.			Outstanding	
	40% of the acreage in the tract is operated by lessees.	Non-owners will lose the use of their leased acreage with no compensation.	Significant to non-owners.	Outstanding	
Land Use	Agricultural use. Minor roads and local utilities	Temporary displacement of existing land use. Relocation or bypass of existing facilities.	Short term, see Vegetation and Agriculture sections. Minor inconvenience.	Acceptable	
Recreation Values	Less than 5% of the tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts significant.	Good - Based on current studies.	
Aesthetics	Dynamic agricultural activity of high visual quality but low scenic value. Favorable topography limits views of the tract.	Short term changes in views until after reclamation are less desirable than the existing, but are not seen from observer position to be of much importance.	Insignificant	Acceptable	

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Dover.

Sept 21 - 7 p.m.

Logan Rules.

Joyce 6601

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Wildlife					
Sensitive Wildlife and Essential Habitats	Essential habitat for sensitive wildlife ranges from 30-70% of the area for about 30 species. Whooping crane and northern swift fox are identified with the area.	Coal mining and attendant actions would severely disrupt and destroy locally significant wetlands and woodlands interspersed with native prairie which singly and in composite constitute the essential habitats for 30 sensitive wildlife species. Offsite aquatic habitats of Otter, Coyote, Brush, and Spring Creek; the Knife and Missouri Rivers; and the Garrison Reservoir would be recipients of potential point and nonpoint pollution.	There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetland, woodlands and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy and Land Use Team. Unsuitability Criteria Application Team (FWS, NDGF & BLM Biologists). Wildlife data quality is high.	To date there are no data to direct successful re-creation (compensation) of native woodlands and wetlands after strip mining in this country. Native prairie comprised of native plant species has not been re-created from mine spoil. If some form of habitat replacement is achieved during mining and thereafter, then the negative impacts to wildlife resources would be proportional to the successful compensation.
General					Increased poaching and disturbance would significantly reduce all wildlife populations in region. If not controlled it would significantly reduce recreation opportunities.
Cultural/ Historical Values	Sample Surveys are complete. Recorded cultural resources will not affect coal mining.	Loss of sites as a result of mining activity.	Anticipated impact is not great because resources can be mitigated through data recovery.	Good	None

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Net Energy Analysis	No fossil fuels are being produced from this tract.	A total of 5.2 million tons of coal (0.6 million tons of Federal coal) will be produced annually. (These figures include all the Federal coal.)	Production: 6919 Btu/lbs. of coal Consumption: 38 Btu/lb. of coal Ratio of production to consumption 184:	Acceptable	
Climate and Air Quality	Good	Totally consumes the allowable class II PSD 24-hour increment for particulates.	Significant	Fair	Any associated PSD source could not contribute significantly ($5ug/m^3$ - 24-hour) to the PSD's class II 24-hour particulate increment.
		SOCIAL AND ECONOMIC CONDITIONS			
Employment	Community services generally adequate for current employment site.	Very small if any increase in employment.	Insignificant	Acceptable	
Population	Community services generally adequate for current population.	Very small if any increase in population.	Insignificant	Acceptable	
Regional Income	$4560 estimated regional income per capita.	Very small if any increase in regional income per capita.	Insignificant	Acceptable	
Infrastructure Assessment (Community Services)	Most community services generally adequate; often with one or two inadequate services.	No change in community service adequacy.	Insignificant	Acceptable	

ANTELOPE TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	No	---	No	---
2. Rights-of-way and easements	No	---	No	---
3. Buffer zones	Yes	No	No	Fed. regs. mandate that these areas be designated unsuitable with possible future exceptions.
4. Wilderness study areas	No	---	No	---
5. Scenic areas	No	---	No	---
6. Land used for scientific studies	No	---	No	---
7. Historic lands and sites	No	---	No	---
8. Natural areas	No	---	No	---
9. Federally listed endangered species	Whooping crane and northern swift fox known or believed to use these regions.	---	Swift fox data very limited.	Exclusion of strip mining from wetlands would protect most whooping crane areas.
10. State listed endangered species	No	---	No	None exist.

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
11. Eagle nests	No	---	No	---
12. Eagle roosts and concentration areas	No	---	No	---
13. Falcon cliff-nesting sites	No	---	No	---
14. Migratory birds	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	Seven species in combination with Criterion 15.
15. State resident fish and wildlife	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	About 30 species in combination with Criterion 14.
16. Flood plains	No	---	No	---
17. Municipal watersheds	No	---	No	---
18. National resource waters	No	---	No	---
19. Alluvial valley floors	No	---	No	---
20. State proposed criteria	No	---	No	None exist.

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